Trip to Sunshine Coast Queensland, September 2004
Visit to Bridge and Foreshore

Report No 2002-059-B No 8

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EXECUTIVE SUMMARY

A trip was undertaken to look at concerns of Public Works and Main Roads Departments of Queensland. David Paterson and Wayne Ganther from CSIRO travelled to the Sunshine Coast with Alan Carse of Queensland Department of Main Roads and Michael Ball of Queensland Department of Public Works. We were also joined for part of the visits by Ed Bowers of QBuild which is a commercial unit of Public Works responsible for maintenance of Public Works.

During the trip we visited a bridge on the David Low Way at Sunrise Beach near Noosa. This bridge was in a serve marine environment with high salt content in the concrete and corrosion of the galvanised guardrails and barriers. Also the foreshore at Coolum was visited and the use of stainless steel was examined. This is discussed in this report. Most problems stemmed from incorrect specification due to lack of awareness of the severity of the environment.

The companion report Visit to Schools Report 2002-059-B No 7. covers the visit to four schools north of Caloundra.

1. INTRODUCTION

As part of the CRC for Construction Innovation project on Case Based Reasoning a trip was undertaken to look at concerns of Public Works and Main Roads Departments of Queensland, these organisations being the projects industrial partners. David Paterson and Wayne Ganther from CSIRO travelled to the Sunshine Coast with Alan Carse of Queensland Department of Main Roads and Michael Ball of Queensland Department of Public Works. The Sunshine Coast area was chosen for the visit due its coastal location and known corrosion problems.

2. BRIDGE ON THE DAVID LOW WAY AT SUNRISE BEACH

The bridge, seen in Figure 1, is located at 26° 25.089' S and 153°06.530'E. It is less than 100 metres from Sunrise beach near Noosa on the Sunshine Coast North of Brisbane in Queensland.

Figure 1 Bridge on David Low Way at Sunrise beach looking east toward ocean

The Bridge is approximately 5 metres high and spans over Orealla Crescent. The coast adjacent to the bridge is a surf beach with some scrubby plants, as seen in Figure 2.

Figure 2. View of sea state near bridge

The bridge is of concrete construction with steel torsion bars. Being so close to the ocean, this bridge had significant problems with chloride (salt). The concrete had very high levels of chloride which has caused some structural problems and would have significantly shortened the life of the bridge. The solution used for this chloride problem was to leach the chloride out of the bridge. This was done by encasing the bridge supports with a material that would leach out the chloride. This material was then replaced when it was full of chloride. The method was repeated until the chloride levels were acceptable. The concrete was then repaired as required and a sealer applied to the concrete to stop more chloride impregnating the concrete.

The following figures show the bridge and associated metal components. The metallic guard rails and supports are made from a number of different materials. The main guard rails and the crash barriers are galvanised and the pipe and supports are painted steel. The galvanised rails show white corrosion products on the surface with some spots of red rust. The pipe and supports show significant paint deterioration and red rust.

The deterioration of the metallic components is generally worst on the seaward side of the bridge, as would be expected.

Figure 3. Top of bridge

Figure 4. Western guard rail

Figure 5. Ocean side of bridge looking from south to north

Figure 6. View of pipeline and guard rail from below bridge

Figure 7. Pipeline and guard rail connections to bridge

Figure 8. Ocean side of bridge looking north

Figure 9. Underneath northern end of bridge

Figure 10. Pipeline and guard rail connections at northern end of bridge viewed from below

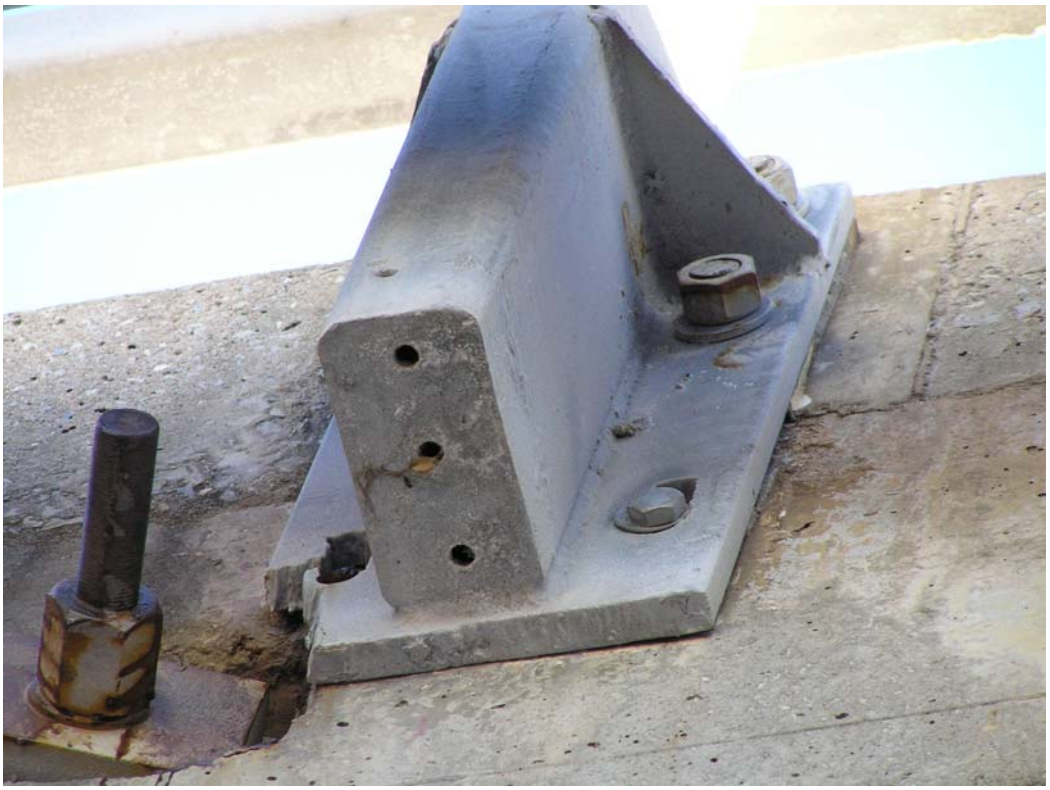

Figure 11. Guard rail support viewed from below

Figure 12. Pipeline support viewed from below showing red rust

Figure 13. Underside of guard rails showing some signs of white corrosion product

Figure 14. Guard rail support seen from below

Figure 15. Pipeline and guard rail supports seen from below

Figure 16. Guard rails seen from below showing white corrosion product and possible red rust

Figure 17. West side of the bridge

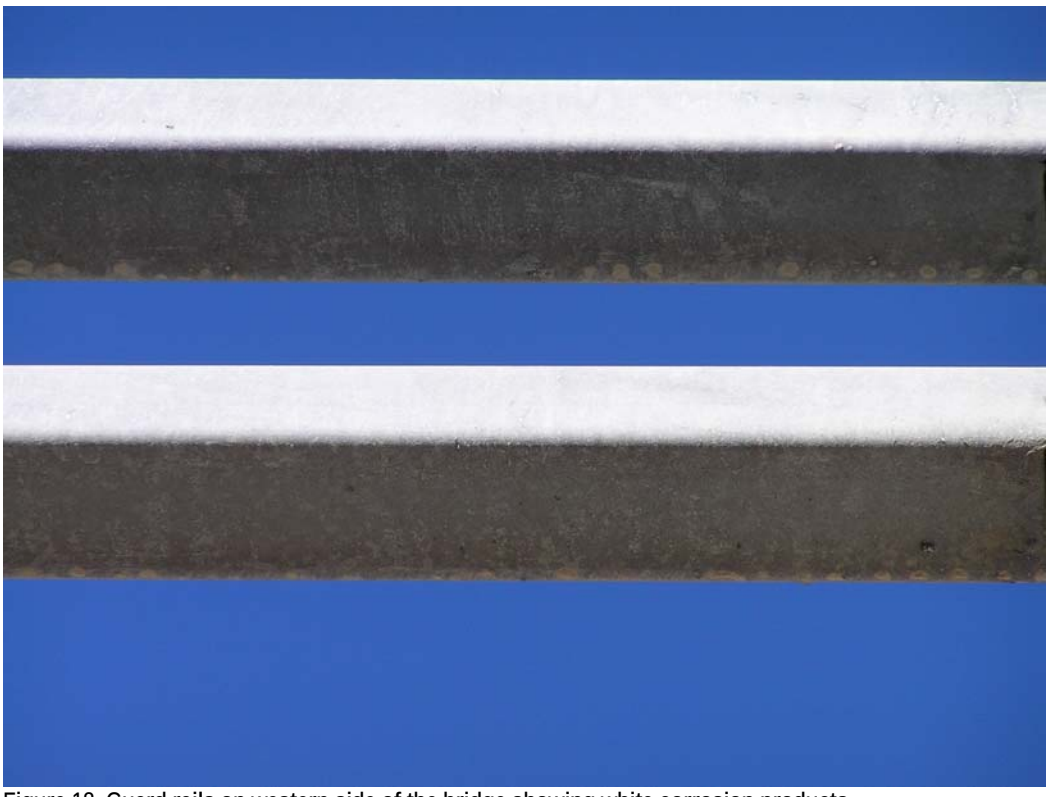

Figure 18. Guard rails on western side of the bridge showing white corrosion products

Figure 19. Guard rail support on western side of the bridge

Figure 20. Support under southern end of the bridge

Figure 21. Close up of corrosion on guard rail

Figure 22. Galvanised crash barriers.

Figure 23. Galvanised crash barrier

3. VISIT TO FORESHORE

The party also visited the foreshore at Coolum Beach. We examined the boardwalk that had been installed only 2 years previously. Figure 24 shows the view of the ocean from the boardwalk and Figure 25 shows the sort of buildings that line the street behind the boardwalk. The boardwalk is located in a particularly severe environment with the beach and ocean directly in front of it.

Figure 24. View of ocean from walkways

Figure 25. View of buildings behind walkway

Figure 26, Figure 27 and Figure 28 show the hand rails and plaque on the boardwalk. The stainless steel handrails and the plaque show excessive "tea staining" which would have been avoided if the level of polishing had been correctly specified.


Figure 26. Handrail and plaque on foreshore boardwalk

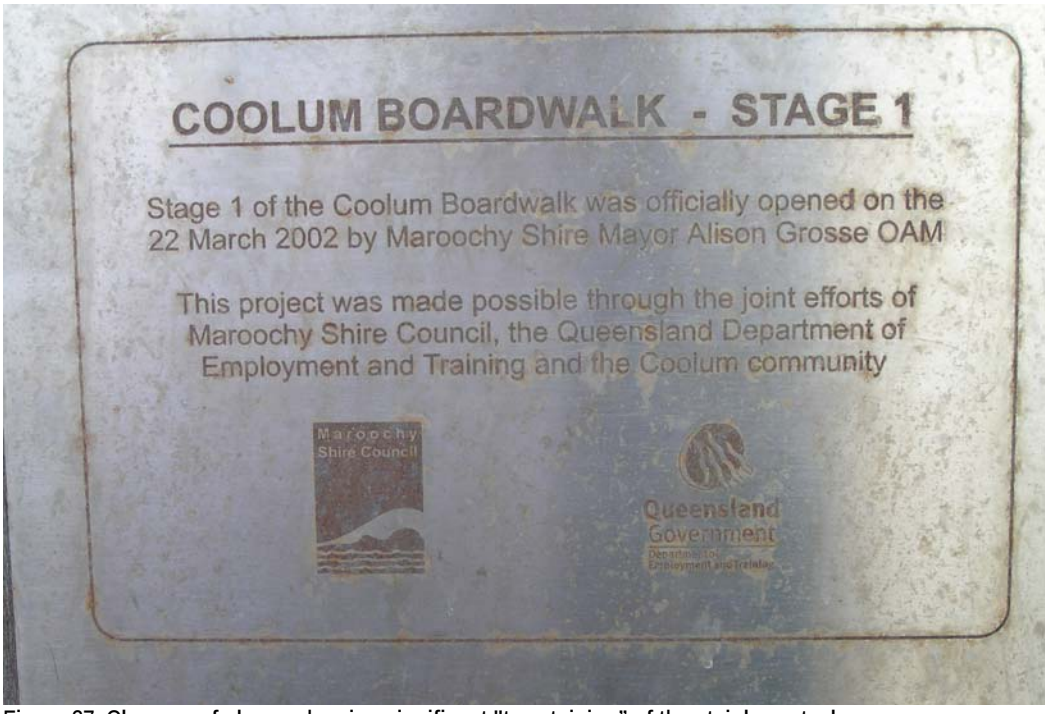

Figure 27. Close up of plaque showing significant "tea staining" of the stainless steel


Figure 28. "Tea staining" on hand rail

“Tea staining” of stainless steels occurs in marine environments and is caused by a number of factors. The simplest way to stop “tea staining” seems to be to specify a

very smooth finish, the smoother the better. Electro polishing would be a method to specify to get a smooth finish and minimise the “tea staining”.

There is an Australian Stainless Steel Development Association (ASSDA) technical bulletin which covers this problem, ASSDA Technical Bulletin “Stainless Steel ‘Tea Staining’ No2 July 2001.

Figure 29 shows some street furniture in the same location that looks to have been correctly specified. It is in good condition while other items are showing staining. Figure 30 shows a bolt on this object that is showing some staining. It is unclear what is causing this staining.

Figure 29. Stainless steel street furniture in good condition

Figure 30. Red rust staining from bolt

Figure 31 shows a canvas shelter support which is showing very severe degradation. Figure 32 shows a close up of the support which is of a painted galvanised steel construction. There is a lot of white corrosion product and red rust present.

Figure 31. Canvas shelter with painted galvanised steel supports

Figure 32. Close-up of shelter support showing red rust, white corrosion product and paint deterioration.

Figure 33 shows a building located directly across from the boardwalk and beach. Figure 34 shows the detail of the roof area with a number of exposed galvanised purlins.

Figure 33. Multi-storey building directly behind beach

These galvanised purlins are showing a lot of white corrosion product and would seem to be the wrong choice for this structure.

Figure 34. Galvanised Purlins on top floor of building showing white corrosion product

4. CONCLUSIONS

The bridge visit showed some of the issues that are raised when building bridges near the coast. The concrete had a high concentration of chlorides and remedial work had to be undertaken to ensure a satisfactory working life. The rails and pipe supports showed the severity of the environment by the amount they were corroding.

The visit to the foreshore was to identify how severe the coast was in terms of corrosion. We looked at structures along the coast to see how they were fairing in the environment. It was found that some, if not most of the infrastructure installed along the coast was incorrectly specified. Some of the components used were not suitable for the severity of the environment. Such as the supports for the shade umbrellas which were painted galvanised steel and the galvanised purlins on the top of the building.

Where more resistant metals were specified they were not fully specified. The stainless steel handrails and plaques were a case in point where the level of finish would seem to be not correctly specified. The stainless steel had excessive "tea staining" which should have been avoided if electro polishing had been specified.